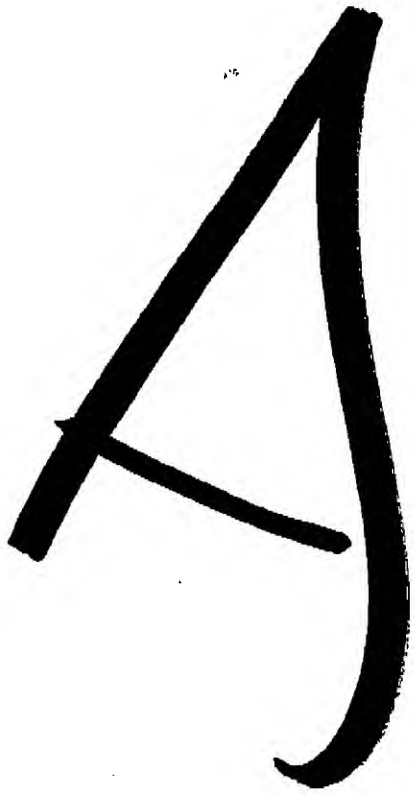
EXHIBIT A



Korean Document 0076805-
Unverified English Translation

This design is regarding an in-circuit emulator system. Specifically, it is regarding an in-circuit emulator system that can be used conveniently with a simple configuration that does not use expensive MDS (microcomputer development system) equipment.

In present in-circuit emulator systems, as illustrated in Figure No.1, the development station (2-1) of the MDS (2) that is the interface between the host computer (1) and serial communications port (RS-232C) uses external memory (2-2) and program memory (2-3) to perform emulation control and the POD (3) that is interfaced with the development station (2-1) of the MDS (2) is interfaced through the CPU board (4-1) and chip adapter (4-2) of the target system so that the input-output board (4-3), drive board (4-4), etc. of the target system (4) are controlled by the CPU operations of that target system, thus carrying out in-circuit emulation. Here, the POD (3) replaces the CPU operation of the target system (4) and so the POD used depends on the type of CPU.

In the present in-circuit emulator system configured as above, after the emulator program is saved to the host computer (1), if the execution file is downloaded from the host computer (1) to the development station (2-1) of the MDS (2) through the serial communications port (RS-232C), then that development station (2-1) is saved to memory and the target system (4) is executed according to the execution file that was saved. Therefore, the POD (3) is used to interface with the CPU board (4-1) of the target system (4) and the POD (3) replaces the CPU of the target system (4) and the real-time emulation is carried out while interfacing with the input/output board (4-3) and drive board (4-4).

At this time, by using the debug function on the host computer (1), the breakpoints are set and the register of the MDS (2) is assigned an address and read so that software errors are detected.

However, the above present in-circuit emulator system needs a microcomputer development system (MDS) specialized for such but the price of this MDS is high and the system configuration is complicated so that it can only be used by an expert.

This design takes the above problems into consideration and does not use an MDS, POD or CPU board of the target system but interfaces with the host computer while interfacing directly with the input/output board and drive board of the target system so that an in-circuit emulator system is created that can perform emulation. The detailed explanation of this is as follows while referring to the attached diagrams.

A central processing unit (CPU) (12) that interfaces through the host computer (11) and serial communications port (RS-232C) to download and upload, as well as to perform emulation on the target system (18); an oscillator (12-1) that inputs and causes output on the central processing unit (12), and a reset circuit (12-2) that inputs and causes a power-on reset signal; a system [illegible] (14) that is accessed through the above central processing unit (12), address, data and control bus and saves the emulator system program; an address latch (13) that downloads the emulation program and also latches the user RAM (15) and address where the data is saved; an address decoder (16) that decodes the address being outputted to the target system (18); and an input/output port (17) that outputs the address, data and control signal to the target system input/output board (18-1), driver board (18-2), etc. of the target system according to the emulation program saved in user RAM (15) and performs emulation while accepting the output of the target system (18).

The application and results of the design configured as above can be explained as follows.

An in-circuit emulation detects whether there are new software errors when, in the design of new programs, the system operation software is executed on the target system where the program is to be applied.

The execution file of the new software that is saved on the host computer (11) is downloaded to the in-circuit emulator system. This means that if the host computer (11) downloads the execution file through the serial communications port (RS-232C), the central processing unit (12) of the in-circuit emulator system receives the input and assigns an address at the same time that the execution file is saved in the user RAM (15). At this time, the execution file is saved while assigning the address of the RAM (15) according to the program of the system [illegible] (14) and when the end of the file is reached, the start address of the RAM (15) is assigned again and, while accessing from the beginning of the execution file, the input/output board (18-1), driver board (18-2), etc. of the target system (18) are interfaced through the input/output port (17). While performing emulation through the above process, every time there is an input of each command for debugging on the host computer (11) through the serial communications port (12), each command is carried out, such as up-loading of the trace register content to the host computer (11). At this time, software errors can be detected by accessing the breakpoint settings and RAM (15) by using the debug function.

Here, the address latch (13) latches the lower 8-bit address of the 16-bit address according to the address latch enable (ALE) signal of the central processing unit (12) and the address of the system [illegible] (14) is assigned so that the address of the RAM (15) is assigned for the upper 8-bit address. Also, the address decoder (16) decodes the address outputted to the target system (18) and emulation control is performed according to the execution file.

As explained above, this design interfaces with the host computer and uploads and downloads the execution file and the in-circuit emulator system is configured so that the emulation can be done while interfacing directly with the input/output board and driver board of the target system. In this way, unlike the present design, under this design the expensive microcomputer development system (MDS), in-circuit emulation POD and CPU board of the target system are not used and it is possible to perform emulation of the target system on the execution file of the host computer by using only the in-circuit emulator system and therefore this reduces the cost of the system development. This simple design can be operated easily and even beginners can conveniently use it in a short time so that the system development time is reduced.

(57) Scope of Patent Claims

Claim No.1
An in-circuit emulator system characterized by being configured with a central processing unit (12) that interfaces through the host computer (11) and serial communications port (RS-232C) to download and upload an execution file and control the emulation of the target system (18) according to the execution file; an emulation system program [illegible] (14); RAM (15) that saves the execution file as well as the emulation data; an address latch (13) that latches the emulation system address; an address decoder (16) on which the address is decoded and where the emulation control signal takes place; and an input/output port (17) that is connected to the output of the address decoder (16), address bus, data bus and control bus and carries out direct input/output interfacing with the input/output board (18-1) and driver board (18-2) of the target system (18), in order to perform direct emulation of the input/output board (18-1) and driver board (18-2) of the above target system (18) according to the execution file after saving the execution file of the above host computer (11).

Diagram